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**Literary Theories**

### Developing Green AI Literacy in Undergraduate English Classrooms: A Cognitive-Pedagogical Approach

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**Abstract:** The growing integration of generative artificial intelligence (AI) tools in Undergraduate English classrooms has significantly reshaped practices of reading, writing, and critical inquiry, yet their environmental costs—particularly energy consumption and carbon emissions—remain largely unaddressed within English Language Teaching (ELT). This study proposes a cognitive-pedagogical approach to developing Green AI literacy among undergraduate learners, conceptualizing it as an interdisciplinary competence that combines ecological awareness, critical digital literacy, and responsible AI usage. Adopting a mixed-method research design, the study was conducted among 58 first-year B.A. English students at Christ College, Irinjalakuda, using structured surveys for quantitative data and reflective writing tasks alongside classroom interventions for qualitative insights. Drawing on cognitive pedagogy, ecocritical theory, and digital literacy frameworks, the proposed model operates across three interconnected domains: cognitive engagement, critical reflection, and sustainable practice. Cognitive engagement fosters metacognitive awareness of how AI tools shape thinking and textual production, while critical reflection enables students to interrogate the ethical, epistemological, and environmental implications of AI-generated content. Sustainable practice promotes mindful AI use through eco-conscious prompting, selective engagement, and reduced computational redundancy. Findings indicate a notable shift in students' awareness of AI's ecological impact and a growing tendency toward responsible usage practices. The study argues that embedding Green AI literacy within ELT not only enhances learners' communicative and critical competencies but also cultivates environmentally responsible digital citizenship aligned with contemporary sustainability imperatives.

**Keywords:** Green AI literacy, Generative AI, Cognitive pedagogy, English Language Teaching (ELT), Ecocriticism, Digital literacy and Sustainable pedagogy.

## **Introduction**

The proliferation of generative AI technologies has introduced new possibilities for teaching and learning in higher education. In English Language Teaching (ELT), tools powered by artificial intelligence are increasingly used for drafting, editing, and interpreting texts, thereby reshaping traditional pedagogical practices. While these tools offer efficiency and accessibility, their underlying infrastructures depend on energy-intensive computational processes that contribute to environmental degradation (Strubell et al.; Patterson et al.). Despite this, classroom discussions often foreground productivity and innovation while overlooking sustainability.

This paper argues for a pedagogical shift from instrumental use of AI toward a more reflective and ecologically informed engagement. It introduces Green AI literacy as a necessary extension of digital literacy, particularly within undergraduate English classrooms where language practices intersect with critical inquiry. By situating AI within a broader ecological and ethical framework, the study aims to bridge technological competence with environmental responsibility.

## **Theoretical Framework**

### **Cognitive Pedagogy in AI-Mediated Learning**

Cognitive pedagogy emphasizes learners' awareness of their own thinking processes. In AI-supported environments, this involves recognizing how generative tools influence idea formation, textual production, and interpretive strategies. Scholars such as Bransford et al. highlight the importance of metacognition in effective learning, a principle that becomes increasingly relevant in technologically mediated contexts.

### **Ecocriticism and Digital Environments**

Traditionally focused on literary representations of nature, ecocriticism has expanded to address material and technological ecologies. As Morton and Heise suggest, contemporary ecological thought must engage with global systems, including digital infrastructures. Applying ecocritical perspectives to AI allows learners to consider the environmental consequences embedded within seemingly intangible technologies.

## Digital Literacy and AI Ethics

Digital literacy now encompasses critical engagement with algorithmic systems, including questions of bias, authorship, and sustainability (Selwyn; Pangrazio and Sefton-Green). The ethical dimensions of AI, as discussed by Floridi, highlight the need for responsible usage practices. Green AI literacy emerges from this intersection, foregrounding sustainability as a core component of digital competence.

## Conceptualizing Green AI Literacy

Green AI literacy is defined here as a situated and reflective competence that enables learners to engage with AI technologies in environmentally and ethically responsible ways. The framework developed in this study includes three interrelated dimensions:

- Cognitive Engagement: Encouraging learners to reflect on how AI tools shape their thinking and writing processes.
- Critical Reflection: Enabling students to question the reliability, ethics, and ecological implications of AI-generated outputs.
- Sustainable Practice: Promoting efficient and purposeful AI usage, including minimizing redundant queries and adopting mindful prompting strategies.

This tripartite model positions learners not merely as users of technology but as critical participants in a broader technological ecosystem.

## Methodology

### Research Design

A mixed-method approach was employed to capture both measurable changes and experiential insights. This design facilitates a more nuanced understanding of how Green AI literacy develops within classroom settings.

### Participants and Context

The study involved 58 first-year B.A. English students at Christ College, Irinjalakuda, representing diverse educational and linguistic backgrounds. The undergraduate ELT classroom served as the primary site of intervention.

## Data Collection

### Data were gathered through:

- Pre- and post-intervention surveys assessing awareness and practices
- Reflective writing tasks documenting student experiences
- Classroom observations during AI-integrated activities

## Intervention Design

### The intervention incorporated:

- Guided use of generative AI tools
- Discussions on environmental costs of AI
- Activities emphasizing efficient and ethical usage

## Pedagogical Implementation

The pedagogical strategies employed in this study were carefully designed to translate the abstract concept of Green AI literacy into concrete classroom practices within undergraduate English Language Teaching (ELT). The first strategy, eco-conscious prompting, involved training students to construct precise, purposeful, and context-sensitive prompts while interacting with generative AI tools. By encouraging learners to avoid vague or repetitive queries, this approach aimed to reduce unnecessary computational load and promote efficiency in AI usage. Students were guided to reflect on how the structure and clarity of their prompts influenced both the quality of responses and the extent of resource consumption, thereby linking linguistic competence with environmental responsibility.

The second strategy, reflective writing, focused on fostering metacognitive and ethical awareness. Students were asked to produce short reflective pieces on their experiences of using AI tools, addressing questions of authorship, dependency, and ecological impact.

These reflections enabled learners to critically examine their own practices, recognize patterns of over-reliance, and articulate concerns regarding sustainability. Such activities also reinforced core ELT objectives, including coherence, argumentation, and self-expression.

The third component, critical AI engagement, required students to evaluate AI-generated texts in terms of accuracy, bias, coherence, and environmental implications. By comparing AI outputs with human-generated texts, students developed a more nuanced understanding of the limitations and affordances of generative technologies. Collectively, these strategies were seamlessly integrated into existing ELT practices, ensuring that the incorporation of Green AI literacy did not disrupt but rather enriched the pedagogical process.

### **Findings and Discussion**

The findings of the study reveal a significant and multidimensional shift in students' awareness, attitudes, and practices following the cognitive-pedagogical intervention. Quantitative data derived from pre- and post-intervention surveys indicate a marked increase in students' recognition of the environmental impact associated with generative AI technologies. Prior to the intervention, most participants demonstrated limited awareness of the energy-intensive nature of AI systems; however, post-intervention responses reflected a more informed and critical understanding of these issues.

Qualitative data, particularly from reflective writing tasks, further highlight the depth of this transformation. Students exhibited heightened critical engagement with AI tools, articulating concerns about ethical use, intellectual dependency, and ecological sustainability. Many participants reported a conscious effort to reduce reliance on AI for routine academic tasks, instead using these tools more selectively and strategically. This shift suggests the development of metacognitive awareness, wherein students became more attentive to how AI influences their thinking and writing processes.

Additionally, students demonstrated greater intentionality in their interactions with AI, adopting concise prompting techniques and avoiding redundant queries. These behavioral changes align with the principles of sustainable digital practice and indicate the effectiveness of the intervention in fostering Green AI literacy. The findings resonate with existing scholarship that underscores the importance of critical pedagogy in shaping responsible digital users, while also extending this discourse by foregrounding environmental considerations within ELT contexts.

## Implications for ELT

The integration of Green AI literacy into undergraduate English classrooms carries significant implications for the future of ELT. First, it necessitates a reconceptualization of curriculum design, wherein digital literacy is expanded to include ecological awareness and ethical engagement with technology. Rather than treating AI as a purely functional tool, educators must incorporate discussions on sustainability, carbon footprints, and responsible usage into classroom practices.

Second, the findings highlight the need for teacher training and professional development in critical AI pedagogy. Educators must be equipped not only with technical knowledge of AI tools but also with the theoretical and ethical frameworks required to guide students toward responsible usage. This includes fostering skills in critical questioning, reflective practice, and interdisciplinary thinking.

Third, the study calls for an expansion of digital literacy frameworks to encompass environmental dimensions. Traditional models of digital literacy often emphasize access, skills, and critical evaluation; however, the growing ecological impact of digital technologies demands a more holistic approach. By integrating sustainability into digital literacy, ELT can contribute to broader educational goals related to environmental responsibility and global citizenship.

Ultimately, these implications suggest that English classrooms can function as dynamic spaces for interdisciplinary learning, where language education intersects with ecological and technological concerns. This repositioning of ELT enhances its relevance in contemporary educational contexts.

## Conclusion

This study demonstrates that a cognitive-pedagogical approach to Green AI literacy can play a transformative role in shaping undergraduate students' engagement with generative AI tools. By integrating cognitive engagement, critical reflection, and sustainable practices into classroom instruction, the proposed framework enables learners to move beyond passive consumption of technology toward more mindful and responsible use. The findings indicate that even short-term pedagogical interventions can significantly enhance students' awareness of the environmental and ethical dimensions of AI, while also promoting more intentional and efficient usage patterns.

Importantly, the implications of this study resonate strongly with the vision of the National Education Policy 2020, which advocates for holistic, multidisciplinary, and value-based education. NEP 2020 emphasizes the integration of technology with ethical awareness, critical thinking, and sustainability, aligning closely with the objectives of Green AI literacy. By embedding ecological responsibility within digital pedagogy, this approach contributes to the development of learners who are not only technologically proficient but also socially and environmentally conscious—an essential goal outlined in contemporary Indian higher education reforms.

Furthermore, the study aligns with global educational and environmental priorities articulated in the Sustainable Development Goals, particularly SDG 4 and SDG 13. By fostering critical digital literacy alongside ecological awareness, the framework supports SDG 4's emphasis on inclusive and equitable quality education that promotes lifelong learning and responsible citizenship. Simultaneously, by sensitizing students to the environmental costs of emerging technologies, it contributes to SDG 13's call for urgent action to combat climate change through awareness, education, and behavioral change. In an era where artificial intelligence is rapidly embedded in educational practices, aligning technological innovation with sustainability is no longer optional but imperative. Undergraduate English classrooms, with their emphasis on discourse, critical inquiry, and reflective engagement, are uniquely positioned to lead this transformation. Integrating Green AI literacy within ELT thus not only enriches language learning but also advances national and global commitments to sustainable and responsible futures.

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